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OF THE

SCIENCE OF ELECTROPLATING

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MEMBERSHIP DRIVE CLOSES JANUARY 1, 1926

On account of the drive committees of a large number of branches not getting under way soon enough, as well as the time required for the necessary routine of every application, it is very evident that it would be desirable to most of the branches that our membership drive be extended another 30 days.

Therefore: To those who **HAVE,** get **MORE,** and to those who have not, get **BUSY** and **GET.**

I would like every member of our society to answer the following question, YES or NO.

Have **you** personally asked an eligible non-member to join our society during this drive?

If your answer is "NO," you have a duty to perform for the A. E. S. and the progress of electroplating.

Would **YOU** shirk your duty?

Yours very truly,
E. J. MUSICK,
Supreme President.

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EDITORIAL

A CHANCE TO HELP IN A GOOD CAUSE

The Research Committee has sent out letters to manufacturers soliciting funds and explaining the advantages of co-operating with the Bureau of Standards in electroplating research; you no doubt have heard your Branch Secretary read this letter.

It is suggested that you encourage consideration of this matter by your employers, by personally talking the proposition over with them, explaining to them that in contributing to this work they are not bestowing a favor upon the Bureau of Standards, but just making Dr. Blum and his staff work harder with all the advantages going to the manufacturers and platers. Everybody get back of this and put it over.

PHILADELPHIA BANQUET

The Editor was indeed fortunate in being able to attend the very successful banquet and educational session at Philadelphia, November 21. Everything went off with a bang, and many of the notables in the electroplating field were there: Blum, Proctor and Hogaboom. Lack of space prevents making mention of all by name. Philadelphia Branch is to be congratulated for this successful event. Over two hundred enjoyed the event.

SOME ASPECTS OF THE ELECTRO DEPOSITION OF CADMIUM

By Charles H. Proctor

While it is only within the past few years that cadmium has become to be considered for commercial electro deposition, it is now being used quite extensively for the protection of steel parts from atmospheric corrosion. The products that are principally plated with this metal are steel screws, nuts and bolts of many sizes and varieties, interior parts of electric meters, signal control systems, etc., or wherever the iron or steel used in construction of such meters or systems require the maximum of resistance to atmospheric corrosion with the deposition of the minimum amount of metal for such protection.

Its absolute comparative value against the well-known patented zinc mercury alloy deposit is undetermined as yet. The Bureau of Standards in a report made to a well-known commercial firm on the comparative resistance of a cadmium deposit on steel as compared with a deposit of equal thickness from the best type of acid zinc solution, gives the comparison as 2½ to 1 in favor of cadmium when exposed to the corrosive action of the Bureau's standard 20% salt spray test solution.

The value of cadmium then as a protective coating for threaded products as small screws and nuts can readily be appreciated.

The value of the zinc mercury alloy as compared with cadmium as a factor for protection of steel against atmospheric corrosion is not very wide apart. Cost is still a very big factor that prevents the more universal use of cadmium. We cannot deposit a metal more cheaply than the cost of the anode, and the best type of pure electrolytic zinc mercury anode would not cost more than 16½ cents per pound, while cadmium anodes cost about 75-85 cents per pound.

Thickness of a deposited metal as a rule determines its wearing qualities, hence, when all factors are considered, then the zinc mercury alloy deposit is the cheapest, the saving being from 65 to 75%. I have mentioned these comparisons so that when a protective metal for steel is

considered, whether cadmium or zinc, the cost factor can be figured from a logical basis, never losing sight of the cost of the anode. During the past year I have had a great many inquiries relative to the deposition of cadmium and the best type of solution, in the writer's opinion, to use.

In writing this short treatise, cadmium and its deposition is considered only from the commercial aspect, as other metals, copper, nickel or silver, and not on basis of any patent that may cover certain specific methods of application and after treatment.

It is not necessary to go into the history of the metal's first deposition, as it has been previously printed in detail in the American Electroplaters' Monthly Bulletin and The Metal Industry.

I have experimented quite extensively with cadmium plating solution at various times, and the solution I have found to give the best results is as follows:

Water	1 gallon
Sodium Cyanide, 96-98%	7 ozs.
Cadmium Oxide	3 ozs.
Caustic Potash	2 ozs.
Cyanobrite	1-15 oz.

The solution should be prepared by first dissolving the sodium cyanide in one-third the total amount of water at a temperature of 120°-140° F. Then add the cadmium oxide, caustic potash and the Cyanobrite. When all is dissolved, add the balance of the water cold so that the solution temperature will be about 80° F. For more rapid deposits, the temperature can be increased up to 120° F.

The voltage should average from 4 to 5, amperage from 5 upwards per square foot of surface, with a maximum of 25 to 40, depending upon the temperature of the solution.

The time of deposit will have to be decided upon, depending upon requirements. The solution gives a uniform gray deposit, which, when scratch-brushed (which should always be done dry), will closely equal scratch-brushed silver.

I have been able to produce quite bright deposits of cadmium by the addition of cyanobrite as collodial factor

in proportions of 1-16 oz. per gallon, increasing up to ⅛ oz. per gallon, if found desirable.

In mechanical barrel plating the basic proportions of the solution should be increased at least 25 to 100% if it is found that the deposition is too slow.

The voltage must be increased to overcome the internal resistance of the mechanical solution—above the 4 to 5 volts mentioned for the still solution, or approximately 6 to 8 volts.

Anodes should be of pure commercial cadmium. If a steel tank is used to hold the solution, then the anodes can come in direct contact with the tank. However, the negative or cathode rod should be very carefully insulated from the tank.

If wooden tanks are used, then there is an advantage in using sheet steel as anodes, about twice in surface area as the cadmium anodes.

The cadmium anodes should be preferably attached to the steel or in direct contact with it. The value of the steel anode cannot be correctly described, but apparently it reduces the possibility of the polarization of the cadmium anode, due to the positive nature of the steel.

The upkeep of the solution should be primarily based upon the anode reducing factors, sodium cyanide and caustic potash, about ⅛ oz. sodium cyanide and 1-64 oz. of caustic potash per gallon a day, more or less, as conditions of the solution may warrant. The drag-out from the solution should be replaced upon the original basis of solution.

The addition of Cyanobrite should be made at intervals, depending upon the color of the cadmium deposit, when it becomes a dark gray or uneven. Dissolve same in sodium cyanide, using 2 parts cyanide to 1 part Cyanobrite, not more than 7½ grains per gallon at any one time, repeating the addition to produce a satisfactory, uniform cadmium deposit, as may be found desirable.

I present to you samples of cadmium plated steel that were plated in the solution given for 15-20 minutes by Mr. Oliver J. Sizelove, and after cadmium plating, the steel cadmium plated chain was ball burnished for 30 minutes, using a solution consisting of water, 1 gallon; soap bark

powder, 3/8 to 1/2 oz. per gallon. The zinc-plated steel chain samples were plated by Mr. C. J. Wernlund of the Roessler and Hasslacher Chemical Company, Plating Research Division, in the standard improved zinc cyanide solution, consisting of water, 1 gallon; sodium cyanide, 4 ozs.; zinc cyanide, 4 ozs.; caustic soda, 4 ozs., and Cyanobrite, 1-15 oz. Time of deposit, 10 to 15 minutes; 4 to 5 volts. The anodes consisting of pure electrolytic zinc, 2% mercury. This type of solution and anodes are patented by the Roessler and Hasslacher Chemical Company, but permission is granted to its customers to use the process without royalty.

The tables covering the comparative values of cadmium deposits, versus zinc deposits under actual corrosion tests, were worked out by Mr. Wernlund, and he will now present them to you.

COMBATING THE PITTING OF NICKEL DEPOSITED DIRECTLY UPON IRON AND STEEL

By James Welsley

The pitting of nickel deposits upon iron and steel has been the subject of much discussion, and its causes the object of much research work for quite a number of years, and in spite of all the time and labor spent, pitting still remains with us. Although I do not profess to know all about it, I would like to express my views and opinion; also my experiences in dealing with this disease. There are, as you are all aware, many differences of opinion as regards the causes of pitting of nickel deposits. Among them are:

1. Solution too acid.
2. Solution too alkaline.
3. Current density too high.
4. Excessive density of solutions.
5. Solution too hot.
6. Imperfections in surface to be plated.
7. Solution too cold.
8. Unequal distribution of current.
9. Metal content too low.

10. Air agitation.
11. Excess of hydrogen.

The question is, which of these is right? If any of the first ten reasons are the cause, then pitting could be cured by changing the conditions responsible. If you change the conditions of any of the above ten causes and correct them, why, then, does the pitting not stay cured?

Have not some of us thought that we had cured pitting by correcting one or other of the first ten causes, only to find that in a few days it has returned again as bad as ever, and have used the same remedy agin only to find out that this time it (the same remedy) has not the slightest effect? During the past few years we have seen positive evidence that the main cause of pitting is hydrogen. The question is: How can we remove the cause? I remember reading an account of the convention held at Philadelphia, Pa., in 1919, and among the things that impressed themselves on my mind, was a paper read by Mr. C. H. Proctor on "Standardization," in which he said: "If you can produce certain results under certain conditions from your plating solutions today, and if you reproduce identical conditions tomorrow, you will produce identical results." I have borne this in mind and by endeavoring faithfully to carry it out, I can honestly state, without fear of contradiction, that we have greatly benefited by it. By we, I mean the concern that I am employed by and myself. I am of the opinion that the foreman plater should be as careful with his solutions, chemicals and anodes as he is in counting his salary. By that I mean that he should keep his solutions and his supplies under his constant surveillance and control as well as his plating room help under correct discipline at all times. His troubles will then decrease in proportion to the amount of effort spent in this direction. If he is equipped with continuous plating machines, continuous filteration and circulation, accurate instruments, and if his solutions are of the correct PH, metal content up to full strength, temperature and current density always uniform, how can he, if he keeps his conditions up to a certain standard, get poor results? It stands to reason that all conditions being correct and having an up-to-the-minute equipment, how then (assuming that hydrogen is the

cause of pitting) can the hydrone gas bubbles find a resting place on a moving cathode in a constantly agitated, circulating and filtered solution? I do not want you to be misled into thinking that we have an up-to-the-minute plating department here. I can assure you that it is far from being such, but it does the job, and as long as it does that there is a very slim chance of any of the more improved types of equipment being installed. We operate three 300-gallon nickel tanks equipped with steam coils, air agitators and continuous filters and circulation. Each has its individual volt and ampmeter, a parallel rehostat; also a 250-gallon cyanide copper tank and two large and one small mechanical plating barrel; have the usual cleaning tanks, etc., with the exception that the cleaner tanks are both electric cleaners, one equipped with centrifugal pump for agitation purposes.

The difficulties that are always met when using hot nickel solutions have all been met by yours truly, and the pitting of nickel deposits from a hot solution are a problem to be tackled with determination, and only by staying with it, and making use of all our opportunities to obtain knowledge of our profession, can these difficulties and troubles be overcome? My nickel solutions I run at a temperature of 115-120° F. are composed of single nickel salts, 40 ozs.; nicked chloride, 4 ozs., and boric acid, 3½ ozs. to the gallon. This is a very fast plating solution, as you will no doubt recognize. I endeavor to keep it up to the mark, using great care, and I have very little trouble with it. I might say here that, although I have three tanks I have only one solution. This is obtained by circulation, and it saves a lot of time in controlling the solution. Before the circulating system was installed the method of operation was as follows: When each tank was loaded and the current cut in, the tank operator lifted each rack out of the solution and directly replaced it. This was repeated in ten minutes. This method was used by me for three years, and I never had any pitting. In fact, I have never had a single reject for pitting of the deposit in 4½ years, and, believe me, we have a rigid inspection of all plated parts,

including the following tests, by our engineering department:

1. Bending at right angles.
2. Drawing in an Erichson sheet metal tester.
3. Salt spray (continuous).
4. Measurement of thickness of deposit by weight.

I also have to work to specifications for our particular line of work. The specifications call for a thickness of .00075, with limits of .0006-.0009 for table appliances of sheet steel, and .0005, with limits of .0004-.0006 for iron, and on brass and copper cercolator bodies, etc., .0005, with limits of .0004-.0006.

Now, you can see what I am up against. When I referred to the operator lifting the racks out of the solution and replacing them and repeating aften ten minutes, I had to let you see that he only lifted them the once after deposition had started, as the thickness called for was deposited direct on the steel parts in 20 minutes, using 45 amps to the square feet of surface to be plated. In the case of the iron parts the deposit is obtained in 13 minutes. Since we installed the circulation and filtration system the lifting of the cathodes has been stopped and the results are very gratifying. One time I used a hot solution (nickel) composed of 32 ozs. single nickel salts, 4 ozs. boric acid and ¼ oz. hydroflouric acid to 1 gallon of water. This solution ran with the usual upkeep for over nine months without a single case of pitting. The solutions that I am using at present I have already described earlier in this paper, but will give again here. Solution composed of

Single nickel salts	40 ozs.
Boric acid	3½ ozs.
Nickel chloride	4 ozs.
Water	1 gallon
Temperature	115-120° F.
Current density	45 amps. sq. ft.
Voltage	6

Average distance from anodes to cathodes, 8½ inches.

Grade of anodes, 94-98° (approximately)

Thickness of deposit, .0008"; time (steel), 20 minutes
.0005"; time (c. iron), 13 minutes
R. H. 5-6, .0005°; time (brass and copper) 12 minutes

I have always been firmly of the opinion that it is quite possible for the foreman plater to adopt some method of standardization suitable for his own and his firm's requirements, and to strive to maintain that standard at all times. If his work comes in bulk, he should know the exct measurement of surface to be plated of each load. By knowing this he can readily calculate from the thickness of his deposit the total amount of metal plated out of the solution, each load, and at the end of the day he knows the amount of metal to be replaced. But if the anode efficiency is equal to the cathode efficiency he need not replace any metal that has been plated out. All that is required is the addition of sufficient solution composed of the **original formula** to bring the solution up to the proper level. If the anode efficiency is lower than the cathode efficiency the metal content decreases, and, without the metal that is plated out being daily replaced it means in all probability pitted deposits, owing to the solution becoming too acid and metal content too low. The metal content of a nickel solution can be determined by the electrolytic method, or by titration with a standard solution of sodium cyanide. The acidity, by several methods. The standard drop ratio method being used to a great extent. The complete control and regulation of acidity will also decrease the probability of pitting in this direction. Some platers blame the cause of pitting on to impurities in the nickel anodes. Others claim that anodes of a high purity are worse offenders. It is in all probability true that nickel anodes of high parity are very passive in solutions containing no chlorides. It has been proved to us that anodes of high purity corrode uniformly if chlorides are present in the solution, and produce better results. Others claim that imperfections in the metal to be plated are the cause of pitting. I do not agree with this at all. These imperfections, if they cannot be seen in the cleaning operations, are not there at all. At all events surfaces to be plated should be examined through a magnifying glass once in a while, and if one or two pieces with imperfections are found, they should be discarded, if they are the cause of a whole tank load of work coming out pitted.

Another opinion of mine is that the foreman plater of

today has no excuse to offer if he should fall down on the job. He cannot truly say that he did not know how to any question that may be put to him or any difficulty that may arise from day to day. If he makes a study of his job, the conditions he has to work under, etc., and strives to increase his knowledge of his prefession, he being a member of the A. E. S., should have no difficulty in overcoming all the usual plating room troubles. But he must leave nothing to chance and strictly maintain the standards that he sets himself to suit his conditions and requirements. Study to keep abreast of the times and improve his knowledge. No one is too old to learn, and no matter the age of a foreman plater, he will find it all to his advantage to acquire some knowledge of chemistry, which will enable him to combat the evils of the plating profession. I attribute my success in the plating field to the methods of standardization which I have in operation, and the strict attention that I give to the smallest details, timing and controlling accurately; also to being a member of this unique Society, whose knowledge is distributed to the whole of our membership through the columns of the REVIEW. Perseverance, ability and integrity are three words that should always be borne in mind by all of us in all our undertakings, and we will be able then to cheerfully meet our troubles and overcome them all, especially that one that has always been the curse of the plating room, viz.: "Pitting."

ZINC CYANIDE VERSUS ZINC SULPHATE PLATING SOLUTION

By A. Pearson, Electrochemical Engineer,

Western Electric Company, Hawthorne, Ill.

(Continued from Last Month, page 19)

As expected from results of laboratory tests the high cyanide concentration gave low current efficiency. From the solution composition used at the start of the test current efficiencies of about 60 per cent were obtained. As the sodium cyanide content decreased and the sodium hydroxide content increased average current efficiencies of

92.33 per cent were obtained in the cyanide solution as compared with 96.92 per cent in the sulphate bath. It will be noted that a considerably higher cathode current efficiency was obtained with the cyanide solution than has been realized by other investigators. This is undoubtedly due to the use of low cyanide and high zinc concentrations.

The laboratory experiment shows that changes in sodium carbonate content did not appreciably affect the current efficiency.

Variations in the sodium hydroxide content do not change the nature of the deposit except as stated above, that is, a high sodium hydroxide content will allow a lower sodium cyanide concentration.

The variations in zinc content of the solution did not alter appreciably the nature of the deposit or the current efficiency.

Within the limits used the brightening agents increased the brightness and smoothness of the deposit in proportion to the amounts present. Frequent additions of the brightening agents and constant conditions of temperature and current density must be maintained if a constant color is required.

Current Density:

A careful study of current density limits was made with the two types of solutions. This was done by means of holding the current at the value at which signs of roughness began to appear at the projecting portions of the surfaces. This test indicated that a current density of from 10 to 15 amperes per square foot in the sulphate solution and from 18 to 25 amperes per square foot in the cyanide solution could be used or an average increase of 27 per cent in the cyanide solution on this class of work.

At the above current density a voltage of from 1 to 2 volts was required in the cyanide bath and from 2 to 3 volts in the sulphate bath.

Effect of Temperature on Current Efficiency:

The following table gives the results of a test showing the relation between temperature and current efficiency:

Temperature °F.	Current Efficiency
85	72.3 per cent
90	76.3 " "
96	79.0 " "
101	85.6 " "
106	87.4 " "
110	90.5 " "
116	89.0 " "
119	92.1 " "

Since the decomposition of sodium cyanide increases with temperature, 110° Fahrenheit was chosen as a suitable operating temperature giving fairly high current efficiency without excessive decomposition of sodium cyanide. The above test was run at a current density of 20 amperes per square foot. This current density was considered satisfactory and, therefore, no attempt was made to show the relation between current density and current efficiency.

Removal of Suspended Matter:

During corrosion a considerable amount of scale and slimes are formed on the anodes. This material becomes detached from the anodes, remains in suspension in the solution and is carried over to the cathode causing rough deposists. Two different methods of overcoming this difficulty were tried out—Anode Bags and Filtration.

The anodes were placed in canvas bags. This kept the suspended matter from the cathode, but the diffusion was retarded, resulting in a low free cyanide and high zinc content inside the bags. In this way the free sodium cyanide inside the bag was reduced to a point where the anodes covered up with a coating of insoluble zinc cyanide and zinc hydroxide. This difficulty might have been overcome by adding sodium cyanide inside the bags. This method, however, was not considered practical on large sale operation and the use of anode bags was abandoned. The table below gives the zinc cyanide concentration inside and outside the bags during the time they were used:

Ounces of Zinc Cyanide Per Gallon	
Inside of Bag	Outside of Bag
11.8	8.45
13.0	9.10
14.0	9.22
14.1	9.22

A small centrifugal pump was installed removing the electrolyte continually from one end of the tank forcing it through a filter cloth bag and discharging it into the opposite end of the tank at the rate of about 10 gallons per minute. This method proved very effective in removing suspended matter and was employed during the remainder of the test.

Distribution of the Deposit:

An important factor in zinc plating on a large scale is the distribution of deposit on the different parts in the same tank load. It is known that with a sulphate solution there is a great variation in the amount of deposit on different parts on the same rack, and in order to insure all parts having the required minumum amount some parts are greatly over-plated. In sixteen tank loads of parts, eight from the cyanide solution and eight from the sulphate solution, all parts of one rack in each load were weighed before and after plating. The number of parts on each rack which had a deposit between 0 and 10 per cent above the part having the minimum deposit on that particular rack were computed. In the same way the other percentages shown in the table below were calculated:

	Cyanide	Sulphate
0—10 per cent	18.5%	8.9%
10—25 " "	35.4	32.9
25—50 " "	33.5	33.5
50—75 " "	8.9	13.1
75—100 " "	3.8	5.5
100—150 " "	None	3.0
150 per cent and over	None	2.9

It will be seen from the above table that there is greater uniformity in the cyanide deposit, other conditions being equal. This has the advantage of allowing a somewhat shorter plating time and a slight saving in zinc as well as producing more uniformly plated work.

Cost Comparison:

While the sulphate solution has a current efficiency of about five per cent greater than the cyanide bath the better distribution of the latter compensates for this difference. For this reason the output per tank varies approximately

as the current density, or is about 27 per cent greater with the cyanide solution.

It was calculated that the maintenance cost of the cyanide solution exceeded that of the sulphate by 19 per cent for labor and 59 per cent for chemicals. These figures are based on actual cost of a weekly analysis of 17 individual sulphate tanks and an estimated daily analysis of a common sample from the circulating system of the cayanide tanks.

Summary of Results

Desirable deposits can be obtained over a wide range of solution compositions.

Due to the solvent action on the anodes the uncombined sodium cyanide should be held at a minimum so as to maintain the solution as near constant as possible.

It is necessary to continually filter the solution in order to remove suspended matter.

The best results are obtained at a solution temperature of about 110° Fahrenheit.

No cyanide odor or fumes are obtained with this solution.

It is somewhat difficult to maintain the color of the deposit constant.

Under proper conditions of temperature, a solution composition and current density a current efficiency of over 90 per cent can be obtained.

On small parts requiring a smooth surface the plating time can be reduced 27 per cent with the use of the cyanide solution.

The average voltage with the cyanide solution is from 1 to 2 volts and from 2 to 3 volts with the sulphate bath.

BRANCH NEWS

Cleveland Branch

The Cleveland Branch of the A. E. S. met Saturday, November 7, at the Hotel Winton for their regular November business meeting, with President Scott presiding. The meeting was called to order at 8 P. M., with a very good attendance, with all officers present. After all business was taken care of papers on "Brass Plating Solution" were read by Mr. Ter Doest and Mr. Heargist, which were very interesting and caused much discussion. Adjournment was called for at 11 P. M.

The application of Charles H. Renert was rejected.

Detroit Branch

Regular November meeting held at D. E. S. Clubrooms, with a record-breaking attendance, but only five applications.

All future meetings will be held at the Detroit Testinf Laboratory, 554 Bagley avenue.

The first Friday will be devoted to business and technical subjects and the third Friday for eductional purposes only.

One member reported rough nickel deposits. After all the causes and remedies were threshed out it dwindled down to clean out the sediment and anodes and use a buffer agent, preferably hydrofluric acid, boni acid or magnesium sulphate.

Another one complained about streaked, black nickel. He was advised to neutralize the excess free acid with ammonium carbonate.

A discussion on artificial abrasives brought out that wheels set up with it do more work, but for the finest work finish with Turkish emery —"if you can get it."

This was a genuine platers' meeting, full of pep and our out-of-town members took advantage of it. They were out in force. But we missed E. Woodmansee. He would have made it "a perfect day."

Boston Branch

Boston Branch met Friday, the 6th, at their new quarters, the Boston Platers' Supply Company, 202 Friend street, Boston, with the president in the chair.

After the regular order of business was over the committee report of the banquet was made and it was a great success, all but two of the members being present.

Different samples of work done by the members were shown—gold, silver, brass, zinc work were shown—some of the finest ever seen.

A talk was given by our president, Mr. Talamona, followed by Mr. Gale on the working of the plant of the Gillette Safety Razor Company. Mr. Gale explained how everything is done from the time the razor is started until finished. Mr. J. Thompson Evans also gave a little talk on how the Waltham watch is made, which was very interesting.

AAt this meeting the secretary, Mr. Garrett, showed a sample of early English and gave a talk on it, which was very good.

After some discussion the meeting adjourned at 10:15 P. M.

Philadelphia Branch

Philadelphia Branch met November 6, at the University of Pennsylvania with the president, George Gehling, presiding.

Communications were read from Research Committee and the Supreme President membership drive, and acted upon. A. K. Graham finished his lectures on "Nickel Solution," and from the remarks of the members they have derived much knowledge from this course.

Mr. Lumbeck especially spoke in high terms what he has learned from these lectures, having been present at every meeting. This is a

great credit to him, as he has quite a distance to travel to the meetings and should be an example to the absentees.

What is the use of belonging to the society if you do not attend and get all the knowledge possible to become a better plater?

Notice will be given later of the next course of lectures.

Toronto Branch

Our October meeting was what might be termed a "hum-dinger." Not an overflow meeting, but the spirit of progress was in evidence. Two new applications one reinstatement and a transfer were produced in three reels. Then the members began to vie with one another to see who could promise most new members this year. Gee, it's a grand and glorious feeling. You've had it, surely. Then the spirit of fraternity and sociability fluttered in, and a motion to hold a progressive euchre party in January was passed and eight prizes were donated before the scribe could scrawl the names of the donors on the wrapping paper scribbler. And these prizes are all high-grade, hall-marked and useful. The booby prizes both passed by the censor.

Then the spirit of knowledge arose in the form of two questions:

Question—What is the comparative value of brass deposit on steel, instead of copper deposit on steel, as base for nickel deposit?

Answer—Brass deposit being harder and brighter than average copper deposit, the results should be better, more effective protection against corrosion, easier colored nickel, cleaner nickel finish. But brass deposit possibly more productive of difficulties in plating than is copper. Depends on conditions and skill of the plater.

Question—Would spotting out be liable to occur in above case?

Answer—Not if solutions were free from caustics and the nickel deposit practically non-porous.

Question—Has the concentrated nickel solution been an asset to the manufacturer, or has its use been injurious to the nickel plating industry?

Answer—Opinions favored a negative answer to first portion of question and an affirmative answer to second portion of the question. In fact, nothing highly favorable to the use of concentrated nickel solutions was brought out in discussing this question. Opinions of others requested.

Question—Brown specks appear on spun brass and cast brass (Florentine finishes, etc.) after lacquering. What is cause, and how may the specks be avoided?

Answer—Quite possible that caustics in cleaning solution are responsible. Avoid use of cleaners containing caustics.

All members within fifty miles of our place of meeting are requested to be present at the December 28 meeting and get fully prepared for the euchre party to be given in January; also do not forget that new members are eypected to produce.

New York Branch

The October meetings of the New York Branch were well attended. The feature of the first meeting was the lively discussions on cromium plating. Mr. William Schneider, our old-time friend, addressed this meeting and gave his views and experiences on same.

The second meeting was also very lively in discussions. Mr. Kernie Swartz, Mr. Dupernell and Mr. Thomas Haddon were in actual debate, Mr. Thomas Haddon upholding workings of old type double nicket solutions and Mr. Dupernell and Mr. Swartz upholding workings of modern single salt solutions.

Committee was appointed for the coming banquet of New York Branch—Mr. Philipp Morningstar, chairman, assisted by Mr. Minges, Mr. McStocker, Mr. Miller and Mr. Sterling.

St. Louis Branch

St. Louis Branch, A. E. S., held its regular meeting Thursday evening, October 22, with about 21 members present. After the regular business Robert Gibson was elected to active membership and eight new applications were received for active membership and one for associate.

St. Louis Branch will hold its annual banquet January 16, at the American Annex, with educational session in the afternoon and a dinner-dance in the evening. Our librarian then read Ray Goodsell's paper on "Spotting Out," and also the discussions from the Montreal convention, which was enjoyed very much, the librarian also read the paper on "Protective Value of Nickel Plating on Iron and Steel," by C. T. Thomas and W. Blum, but the time limit prevented us from going all the way through with it, so it was layed over till next meeting.

St. Louis Branch

At a well-attended November meeting two new applications were received, the meeting was then turned over to our past librarian, Mr. Frank Horath, who took up the subject "99+% Nickel Anodes," which was very interesting, and everyone present thought it an evening well spent.

President E. J. Musick reported the banquet well under way. Adjourned at 10 P. M.

Bridgeport Branch

The regular meeting was called to order by President Flaherty on November 6th, at 8:15. A letter from Supreme President Musick was read, urging the members to put their shoulders to the wheel in the drive for new members. Most of those present promised to interview prospects that they knew of.

The letter sent out by the Research Committee was read and discussed.

It was decided to hold "Old Timers Night" on Friday, November 20th. R. J. O'Connor agreed to read a paper on Chemistry.

New York Branch

We held our open meeting last Friday night and had quite a large gathering, having an attendance of 84, including in addition to the non-members, of which we had about 50 per cent., we were honored by the presence of Dr. Skkowronski of the Raritan Copper Works of the Anaconda Company, Mr. G. B. Hogaboom of Newark, N. J., and that other popular and well-known member, our genial friend, "Dad" Liscomb of Chicago, Ill., all of whom done their share to make the evening entertaining and instructive. After President Fischer had disposed of the necessary business of the evening by requesting Secretary Sterling to read off the communications received from Suprement President Musick relative to the drive for membership, and one from Chairman Hanlon of the Supreme Research Committee regarding the drive to obtain the support of managers for the research work at the Bureau of Standards, and the announcement of the banquet of the Philadelphia Branch, as well as exhibiting the poster issued by the Milwaukee Branch, of which a copy had been received by the secretary, he invited Past President Morningstar to assume charge of the meeting, who started the good and welfare by introducing Dr. Skowronski in a very gracious manner as the speaker of the evening.

Dr. Skawronski in a very able manner gave us a brief history of the origin of electroplating and electrorefining of metals, after which he gave us a very illuminating and thorough description of the most modern methods of electrorefining of copper and its by-products, such as gold, silver, nicked, platinum, pallidium, etc., as well as the production of copper sulphate, nickel sulphate, tellurium oxide, etc. At end he exhibited lantern slides of the plant of the Rariton Copper Refinery in Perth Amboy, N. J., which is, I believe, the second largest in this country.

The Doctors' lecture brought out quite an interesting discussion relative to the various phases of electrofining and its relationship to electroplating, and he was swamped with questions which is the best proof of the interest taken in his lecture.

Mr. Hogaboom gave quite an interesting talk upon the aims of the A. E. S., and the matter of obtaining the support of the managers for the work of Research at the Bureau of Standards, and our good friend, Dad Liscomb in his talk, devoted most of his remarks to the non-members present, urging them to join the A. E. S., and citing various examples and benefits to be derived from membership in the Society.

After all these gentlemen had been heartily applauded and had received the thanks and appreciation of the assemblage, the Refreshment Committe got busy, and done their "bit" to make the rest of the evening enjoyable. Taken all in all we had one grand meeting and it looks as though we will have to make these open meetings a more frequent occurrence.

In conclusion, we must give our heartiest thanks to the Committee for the thorough manner in which they arranged this meeting and for its success, which has been the means of obtaining several applications and the promise of several more.

Chicago Branch

Regular monthly meeting of Chicago Branch, held November 14, 1925.

Meeting called to order with President F. L. Greenwald presiding, and all officers present.

Our Membership Drive Committee showed some excellent work, having seven new applications for the first week of the drive and promise many more for the coming meeting.

Banquet Committee reported progress, the banquet to be held January 23, 1926 at the Morrison Hotel, with an Educational program in the afternoon, Banquet, and Dancing in the evening.

Question Box

Question (1) What is the cause of Silver Solution crystalizing in temperature of 50 Degree.

Answer (1) To much sodium carbonate.

Question (2) My hot cyanide copper solution leaves black streaks on under sides of objects being plated, otherwise plates O. K.

Answer (2) Hypo cause these black streaks, lack of cyanided in too concentrated solution was stated to cause same.

Question (3, Would it be proper to use a straight double nickel solution with an addition of sal ammonia for plating die castings.

Answer (3) Yes, with an addition of magnescium sulphate. One member stated that he used sodium sulphate with good success.

Question (4) What effect if any on plating generator to connect tanks both in parallel and in series.

Answer (4) No effect on generator if not used to exceed the rating of machine.

Waterbury Branch

President Barrie Hackett presided at the meeting of Waterbury Branch, A. E. S., Friday evening, November 13th. A delegation was present from the Bridgeport Branch. Ray O'Connor, secretary of the latter Branch, and a member of the A. E. S. Research Committee, made a few remarks in connection with the circular being sent out to the manufacturers by the A. E. S., for the purpose of obtaining donations to be used in the maintaining of a chemist at the Bureau of Standards in Washington. Pure nickel anodes was a subject that brought up some interesting remarks. A more lengthy talk on this topic will take place at one of the meetings in the near future. Other subjects touched on were the plating of magnetized articles and the difficulties attending same; also the troubles arising from damp air in a lacquer room. Promises have been received from a number of the Branch members to present papers in connection with the various finishes under their jurisdiction.

A large number of the members were present and future fall and winter meetings will undoubtedly be well attended. A social session followed the meeting, refreshments being served.

APPLICATION FOR MEMBERSHIP

New York Branch

John Mattil, Active .....2163 Gleason Ave., N. Y. C.
John Morris, Active .....790 Madison St., Brooklyn
Thomas H. Johnson, Associate .....23 West 24th St., N. Y. C.
Anthony Dellacava, Active .....1019 East 212th St., N. Y. C.

Philadelphia Branch

J. F. Green, Active .....201 E. 30th St., Wilmington, Del.
A. R. Graham, Associate .....2524 Girard Ave., Phila. Pa.

Toronto Branch

Victor J. Punter, ...25 Leonard Street, Niagara Falls, Ontario, Can.

Detroit Branch

Geo. Timmerman .....2554 Grand River Ave., Detroit, Mich.
Geo. F. Raab., ...2574 Pennsylvia Ave., Detroit, Mich.
Wylie F. Berger .....5787 Fischer Ave., Detroit, Mich.
Wm. J. McDonald .....15411 Kentucky Ave., Detroit, Mich.
Joseph J. McCluskey ..%Alloy Steel Spring & ..Axle Co., Jackson, Mich.

St. Louis Branch

Harry Fanter, Active .....4958 Schollmeyer Ave., St. Louis, Mo.
Torrlis A. Lyche, Associate .....5536 Pershing Ave., St. Louis, Mo.
Rees J. Rickett, Active .....4156 Fair Ave., St. Louis, Mo.
Dominick Lovatto, Active .....7829 Water St., St. Louis, Mo.
Frank Wm. Lafser, Active .....5016 Alaska Ave., St. Louis, Mo.
Thos. S. Tracy, Active .....1619 Cass Ave., St. Louis, Mo.
Arthur G. Musick, Active .....10 North 11th St., St. Louis, Mo.
Homer A. Doerr, Active .....2729 St. Louis Ave., So. Louis, Mo.
August Coever, Active .....4218 Lee Ave., St. Louis, Mo.
James D. Waldron, Associate

Chicago Branch

Clarence H. Brown, Active .....255 Main St., Valparison, Ind.
Cecil M. Knights, Active .....610 Euclid Ave., Glen Ellyn, Ill.
George Glasser, Active .....2432 Queen St., Dubuque, Iowa
Barney H. Ross, Active .....1428 Winnemac Ave., Chicago, Ill.
Roy P. Gauthier, Active .....5346 Berenice Ave., Chicago, Ill.
William Stopper, Active .....2042 North Pripp Ave., Chicago, Ill.

New York Branch

Mr. C. R. Wheeler.....c|o Eclipse Mfg. Co., Elmira, N. Y.
Mr. Arthur J. Duis .....85 Hunter St., Long Island City, N. Y.

Milwaukee Branch

Charles Unke .....481 65th Ave., West Allis, Wis.

ELECTED TO MEMBERSHIP

Cincinnati Branch

Charles Clingel, Active .....1406 Vine St., Cincinnati, O.

Toronto Branch

Thos. Johnson .....271 Spadina Road, Toronto, Ontario, Canada
Lyle Morrison .....929 Oak St., Niagara Falls, Canada

Rochester Branch

Adolph Neubeck .....2650 Main St., Buffalo, N. Y.
Wm. H. Naer.. .....211 Helen St., Syracuse, N. Y.

New York Branch

Kenie W. Schwartz, Associate
c|o Metal & Thermit Corp., 92 Bishop St., Jersey City, N. Y.
Frank Laeb, Active .....3007 Cooper Ave., Glendale Long Island, N. Y.
Lucion C. Lodalce, Active .....497 Euclid Ave., Brooklyn, N. Y.
Frank X. Russell, Active .....2324 Summerfield St., Brooklyn, N. Y.
John Heimer, Active .....43 Poplar St., Jersey City, N. J.
Fred Muschler, Active .....P. O. Box 93, Glenville, N. J.

Milwaukee Branch

Albert Gross, Active .....1360 American Ave., Milwaukee, Wis.
Nickolaus Servatius, Active .....323 East State St., Geneva, Ill.

St. Louis Branch

Robt. Gibson .....2945 East 4th St., Los Angeles, Calif.

Pittsburg Branch

John E. Lohastoeter .....1312 Sheffield St., N. S. Pittsburg, Pa.
Harry A. Spangler .....6343 Broad St., Pittsburgh, .Po

Philadelphia Branch

M. Dumsha Active .....5015 Melrose St., Phila.

Milwaukee Branch

Charles Bauman .....587 Pine St., Burlington, Wis.

Cleveland Branch

Charles H. Renert .....c|o Firestone Steel Products Co., Akron, Ohio

Cincinnati Branch

Charles Oingel .....1406 Vine St., Cincinnati, Ohio.

REINSTATED

Philadelphia Branch

P. A. Lower, Active .....4045 N. Marshall St., Phila.

Toronto Branch

Wm. J. Lamb .....664 Woodland Ave., Detroit, Mich.

SUSPENDED

Dayton Branch

Robert Monce .....29 La Bell St., Dayton, Ohio
R. G. Maeder .....N. C. R., Dayton, Ohio

BOSTON

Regular meetings are held first Friday of each month, at 8 p. m., at the Boston Platers' Supply Co., 202 Friend St., Boston. Secretary, A. W. Garrett, 89 Alexander St., Dorchester, Mass.

BRIDGEPORT

Meets first and third Friday of each month at 62 Cannon St., Room 17, Bridgeport, Conn. Secretary R. J. O'Connor, 1228 Noble Ave., Bridgeport, Conn.

CHICAGO

Meets second Saturday of each month, at 8 p. m., Atlantic Hotel, 316 S. Clark St. Secretary, Robt. Meyers, 2210 Wilson Ave., Chicago, Ill.

CINCINNATI

Meets every Thursday, 7:30 p. m., at Vocational Training School, Spring and Liberty St. Secretary, W. J. Husing, 729 McMakin Ave., Cincinnati, Ohio.

CLEVELAND

Meets first Saturday of each month at Hotel Winton. Secretary, H. S. Kneeland, 3924 Clybourne Ave., Cleveland, Ohio.

HARTFORD-CONN. VALLEY

Meets on the fourth Monday of each month at 747 Main St., Hartford, Conn. Secretary, Tennant Elwin, 1145 Boulevard, West Hartford, Conn.

DAYTON

Meets first Saturday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, Albert Bates, Box 34, Vandalia, Ohio.

DETROIT

Meets the first and third Friday of each month at the Detroit Testing Laboratory, 554 Bagley Ave., Detroit. Secretary, Geo. Kutxen, 1087 State Fair Ave., Detroit, Mich.

GRAND RAPIDS

Meets on the second Wednesday of each month at the Vocational High School, 129 Bostwick Ave., N. E. Secretary, John Raven, 1139 Emerald Ave., Grand Rapids, Mich.

INDIANAPOLIS

Meets the second Saturday of each month at Hotel Denison. Secretary, Louis Mertz, 1725 Union St., Indianapolis, Ind.

MILWAUKEE

Meets second and fourth Thursdays of each month at Lipps Hall, 321 3d St. Secretary, Roy Hunt, 1314 Atkinson Ave., Milwaukee, Wis.

MONTREAL

Meets every Friday at 84 Craig St. West. Secretary, John H. Feelay, 411 Aylmer St., Quebec, Canada.

NEWARK

Meets first and third Fridays of each month at Hotel St. Francis, 22-24 E. Park St., Newark, N. J., at 8 p. m. Secretary, F. W. Matts, 55 Concord Ave., Hilton, N. J.

NEW YORK

Meets every second and fourth Fridays of each month in the World Building, Park Row, New York City, N. Y. Secretary, J. E. Sterling, 468 Grand Ave., Long Island City, N. Y.

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, P. Uhl, 2432 North 29th St., Philadelphia, Pa.

PITTSBURGH

Meets first Saturday of each month at 8 p. m., at United States Bureau of Mines Bldg., Forbes St. Secretary, S. E. Hedden, 227 Fifth St., Aspinwall, Pa.

PROVIDENCE-ATTLEBORO

Meets first and third Thursday of each month at 184 Washington St., Room 308, Providence, R. I. Secretary, Robert Crook, 185 County St., Attleboro, Mass.

READING

Meets on the second Tuesday of each month. Secretary, William M. Fisher, 654 Gordon St., Reading Pa.

ROCHESTER

Meets every second and fourth Saturday of each month at the Powers Hotel. C. A. Reama, Secretary, 512 Lyell Ave., Rochester, N. Y.

ST. LOUIS

Meets first Tuesday of each month at Barr Branch Library, corner Jefferson and Lafayete Sts. Secretary, F. P. Menniges, 3205 A Arsenal St., St. Louis.

TOLEDA

Meets first Thursday of each month at Toledo University Science Building, Electro-Platers' Room, corner Cherry and Page Sts. Secretary, W. W. Weiker, 411 3d St., Toledo, Ohio.

TORONTO

Meets fourth Monday of each month at Canadian Foresters' Hall, 22 College St., Room No. 2. Walter L. Barrows, 628 Dover Court Road, Toronto, Ontario, Canada.

WATERBURY

Meets every second and fourth Friday of each month. Secretary, Wm. F. Guilfoile, 14 Oakland Ave., Waterbury, Conn.